MI-97004
GEK-76074
Use with GEI-81978 and GEK-29462

INSTRUCTIONS

MODULATING GOVERNORS FOR GENERAL ELECTRIC DIESEL ENGINES

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ALLIED PUBLICATIONS

PG ENGINE CONTROL GOVERNOR GEI-81978
GOVERNOR DATA GEK-29462

FOREWARD

This instruction has been prepared to cover the operation and adjustments of the modulating governor. Adjustment values for specific models of governors are given in GOVERNOR DATA instructions, GEK-29462.

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GENERAL

A modulating governor is a Woodward PG-EV governor to which has been added a special resetting low oil-pressure failure device and a special resetting low water-pressure failure device.

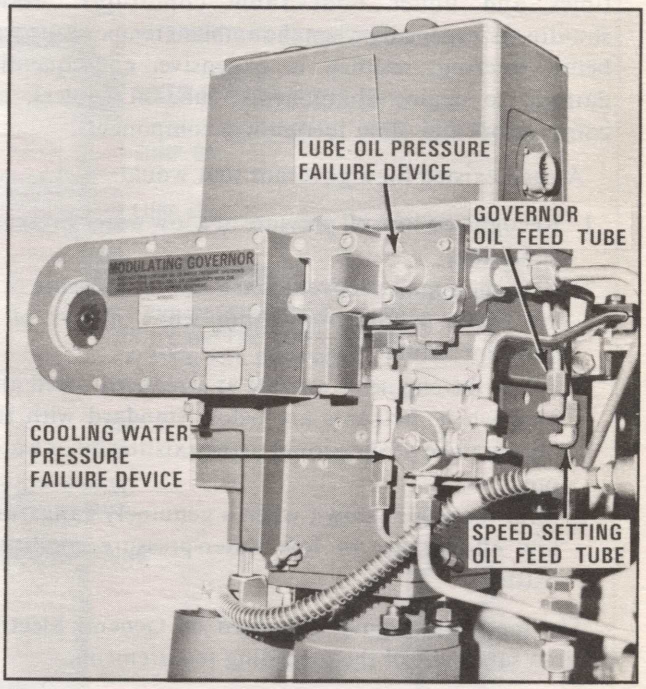

MODULATING GOVERNOR
LUBE OIL PRESSURE FAILURE DEVICE
GOVERNOR OIL FEED TUBE
COOLING WATER PRESSURE FAILURE DEVICE
SPEED SETTING OIL FEED TUBE

FIG. 1. MODULATING GOVERNOR.

FIG. 1, E-26603

A modulating governor will vary the engine speed and load so they are proportional to the existing lube-oil and cooling water pressures when these pressures drop below the trip values of the governor. Should the pressures drop to a dangerously low value, the governor will cause the engine to shut-down.

The governors used on General Electric diesel engines have, for many years, had devices which caused the engine to shut-down in the event of dangerously low lubricating oil or cooling water pressures. Shutdown or trip values varied with different models of governors. Shutdown values also varied with different locomotive throttle notches (engine speeds). Refer to GOVERNOR DATA instructions for specific values.

These instructions do not purport to cover all details or variations in equipment nor to provide for every possible contingency to be met in connection with installation, operation or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to the General Electric Company.

Verify numbers for parts, tools, or material by using the Renewal Parts or Tool Catalogs, or contact your General Electric representative for assistance. Do not order from this publication.

GENERAL ELECTRIC

While these governors performed their function and prevented extensive damage to engine components, they often effected an engine shutdown when a transient low-pressure condition existed. Many of these transient low-pressure conditions would have corrected themselves had the engine been allowed to continue to operate.

Unfortunately, many of these transient low-pressure conditions caused engine shutdowns at very undesirable times and under undesirable conditions. Many shutdowns, especially when the ambient temperature was below freezing, resulted in expensive, consequential damage to engine components, lube-oil coolers, air compressors and other locomotive components.

A need existed for a governor that would:

1. Recognize a low oil pressure or a low water pressure condition.
2. Help the engine recover from a low oil pressure or a low water pressure condition when it was of a transient nature.
3. Allow the engine to operate at a reduced speed and load when pressures are below standard with the output to be proportional to the existing oil or water pressure.
4. Shut the engine down when a genuinely dangerous low oil-pressure or low water-pressure condition existed.

The modulating governors used on General Electric engines satisfy all of the preceding requirements.

OPERATION

In order to understand the operation of the modulating governor, it is necessary to have a knowledge of the basic governor functions. These are described in PG ENGINE CONTROL GOVERNOR instructions GEI-81978. It is also desirable to have an understanding of the low oil pressure and low water pressure devices used on governors for several years prior to the modulating governor.

FORMER GOVERNOR — WITH LOW OIL PRESSURE AND LOW WATER PRESSURE SHUTDOWN PLUNGERS (BUTTONS)

The low oil pressure shutdown device is shown in Fig. 2. The movement of the shutdown valve plunger is effected by lube-oil header pressure and a load spring tending to move it to the right; speed setting oil pressure and the valve plunger springs tend to move it to the left. When the lube-oil pressure in the engine header is above the trip value, all parts of the shutdown device are in the position shown in Fig. 2. In this position, the left side of the shutdown piston is vented to the sump.

When the lube-oil pressure in the engine header drops below the trip value, the force of the speed setting oil pressure and the valve plunger springs exceeds the force of the lube oil pressure and the load spring. The shutdown valve plunger moves to the left, Fig. 3, and the following sequence of events occurs:

1. Governor oil passes around the shutdown valve plunger to the face of the shutdown piston.
2. The shutdown piston is moved toward the right and this in turn moves the inner spring and shutdown plunger to the right.
3. When the shutdown plunger moves sufficiently, it trips the alarm switch. In addition, oil trapped above the speed setting servo piston flows around the smaller diameter on the left end of the shutdown plunger and drains to sump.
4. The speed setting servo spring and the speeder spring then move the speed setting servo piston upward. The top of the piston lifts the shutdown nuts and rod and the rod lifts the governor pilot valve plunger. This allows the oil trapped below the power piston to drain to the sump. Refer to Fig. 2.
5. The power piston moves to the fuel OFF position and, in so doing, moves the fuel linkage and all fuel injection pumps to the fuel OFF position to shut down the engine.

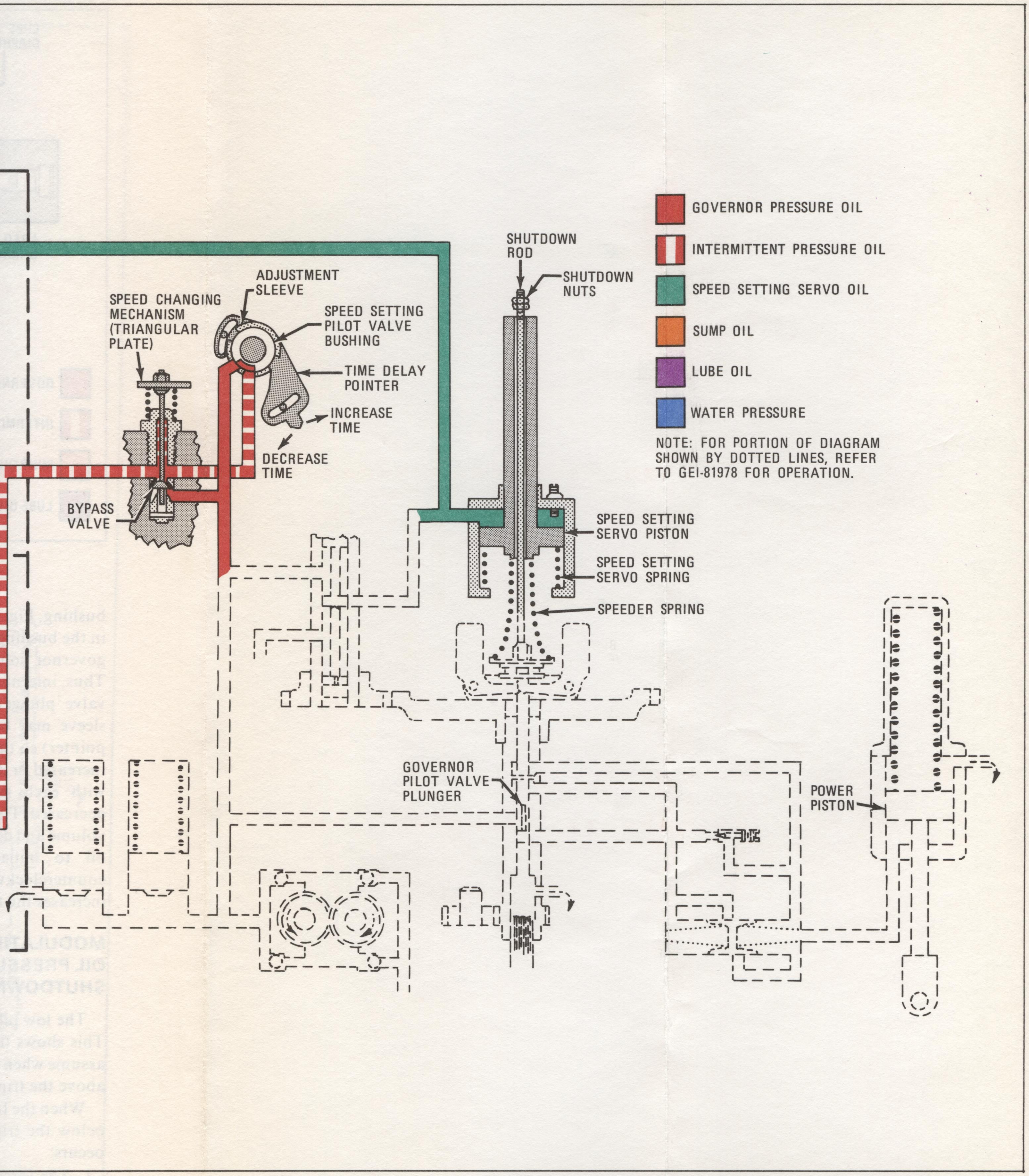
The low water pressure shutdown device is also shown in Fig. 2. It operates in a manner similar to the low oil pressure shutdown device to shut down the engine when a dangerously low cooling-water pressure exists.

> **NOTE:** ***The shutdown plunger(s) must be manually pushed back in before the engine can be restarted.***

BYPASS VALVE

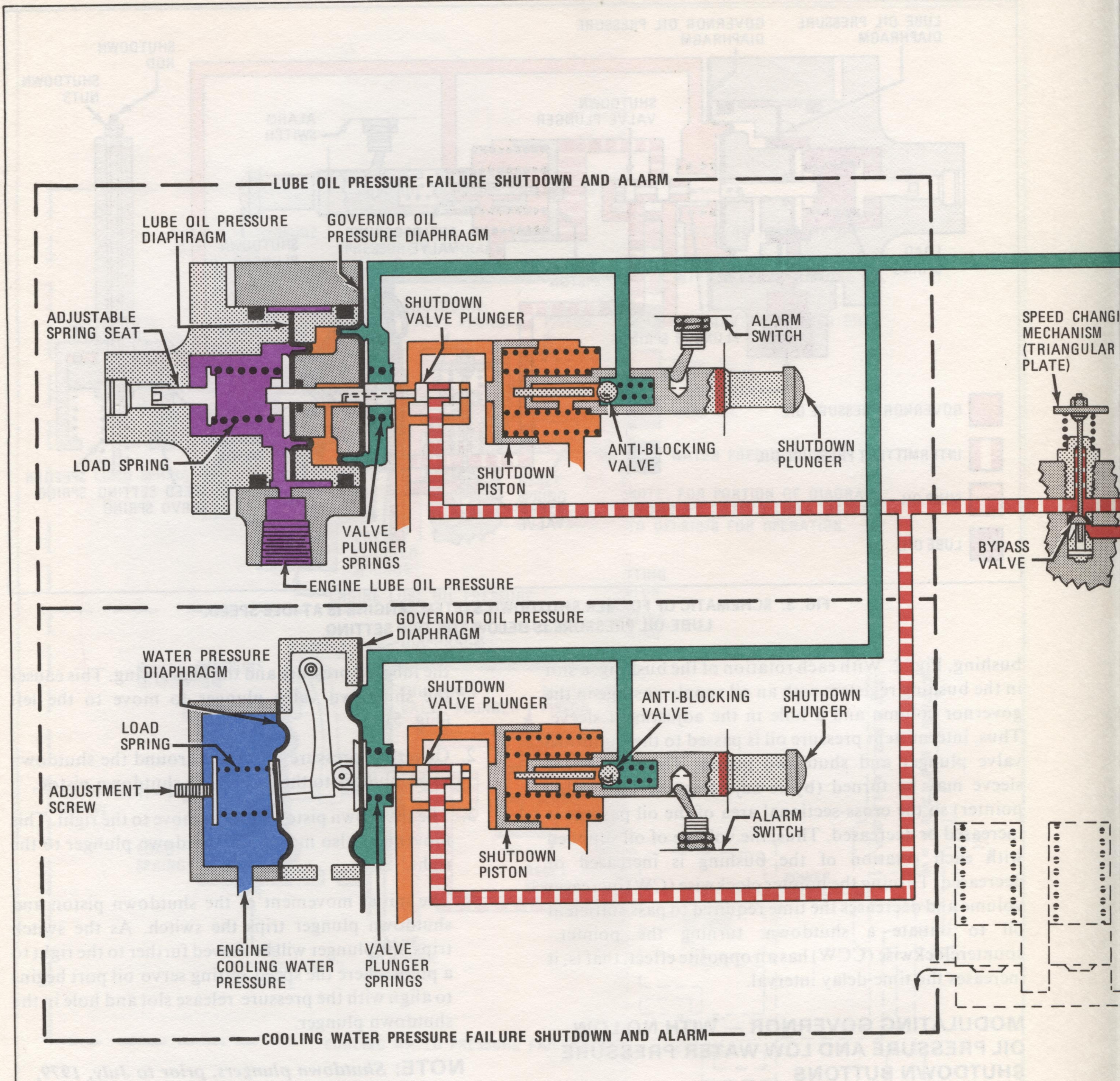
Governor pressure oil is supplied to the shutdown piston at different rates, depending on the governor speed setting and depending on the setting of the adjustment screw in the triangular plate. At certain speed settings (refer to GEK-29462, Table E), the bypass valve, Fig. 2, is moved down off its seat by the adjustment screw. Governor pressure oil then passes directly to the shutdown piston to cause an immediate engine shutdown in the event of a lube-oil pressure failure or a cooling water-pressure failure.

When starting, at idle speed(s) and sometimes at Notch 1 and 2 speeds, the bypass valve is closed and governor pressure oil travels through an intermittent flow orifice in the rotating speed-setting pilot-valve


SPEED CHANGING MECHANISM (TRIANGULAR PLATE)
ADJUSTMENT SLEEVE
SPEED SETTING PILOT VALVE BUSHING
TIME DELAY POINTER
INCREASE TIME
DECREASE TIME
BYPASS VALVE
SHUTDOWN ROD
SHUTDOWN NUTS
SPEED SETTING SERVO PISTON
SPEED SETTING SERVO SPRING
SPEEDER SPRING
GOVERNOR PILOT VALVE PLUNGER
POWER PISTON
🟥 GOVERNOR PRESSURE OIL
▥ INTERMITTENT PRESSURE OIL
🟩 SPEED SETTING SERVO OIL
🟧 SUMP OIL
🟪 LUBE OIL
🟦 WATER PRESSURE

NOTE: FOR PORTION OF DIAGRAM SHOWN BY DOTTED LINES, REFER TO GEI-81978 FOR OPERATION.

FIG. 2. SCHEMATIC OF FORMER SHUTDOWN SYSTEM. ENGINE IS AT IDLE SPEED. OIL AND WATER PRESSURES ARE GREATER THAN TRIP SETTINGS.



LUBE OIL PRESSURE FAILURE SHUTDOWN AND ALARM
LUBE OIL PRESSURE DIAPHRAGM
GOVERNOR OIL PRESSURE DIAPHRAGM
ADJUSTABLE SPRING SEAT
SHUTDOWN VALVE PLUNGER
ALARM SWITCH
LOAD SPRING
ANTI-BLOCKING VALVE
SHUTDOWN PLUNGER
SHUTDOWN PISTON
VALVE PLUNGER SPRINGS
ENGINE LUBE OIL PRESSURE
SPEED CHANGI
MECHANISM
(TRIANGULAR
PLATE)
BYPASS VALVE
GOVERNOR OIL PRESSURE DIAPHRAGM
WATER PRESSURE DIAPHRAGM
SHUTDOWN VALVE PLUNGER
ANTI-BLOCKING VALVE
SHUTDOWN PLUNGER
LOAD SPRING
ADJUSTMENT SCREW
ALARM SWITCH
SHUTDOWN PISTON
ENGINE COOLING WATER PRESSURE
VALVE PLUNGER SPRINGS
COOLING WATER PRESSURE FAILURE SHUTDOWN AND ALARM

FIG. 2, E-26604

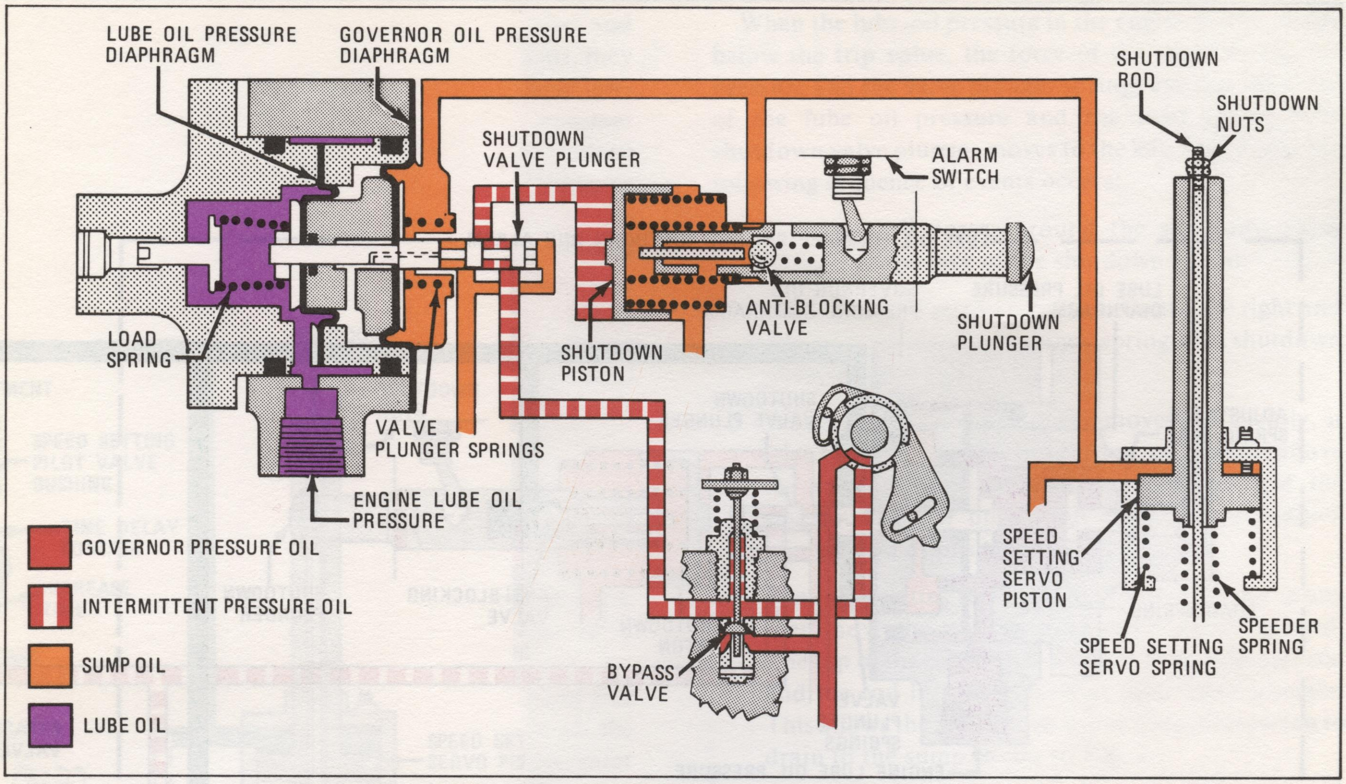

LUBE OIL PRESSURE DIAPHRAGM
GOVERNOR OIL PRESSURE DIAPHRAGM
SHUTDOWN ROD
SHUTDOWN NUTS
SHUTDOWN VALVE PLUNGER
ALARM SWITCH
LOAD SPRING
ANTI-BLOCKING VALVE
SHUTDOWN PLUNGER
SHUTDOWN PISTON
VALVE PLUNGER SPRINGS
ENGINE LUBE OIL PRESSURE
SPEED SETTING SERVO PISTON
SPEEDER SPRING
SPEED SETTING SERVO SPRING
BYPASS VALVE
GOVERNOR PRESSURE OIL
INTERMITTENT PRESSURE OIL
SUMP OIL
LUBE OIL

FIG. 3, E-26605

FIG. 3. SCHEMATIC OF FORMER SHUTDOWN SYSTEM. ENGINE IS AT IDLE SPEED. LUBE-OIL PRESSURE IS BELOW THE TRIP SETTING.

bushing, Fig. 2. With each rotation of the bushing, a slot in the bushing registers with an oil supply passage in the governor column and a hole in the adjustment sleeve. Thus, intermittent pressure oil is passed to the shutdown valve plunger and shutdown piston. The adjustment sleeve may be turned (by re-adjusting the time delay pointer) so the cross-sectional area of the oil passage is increased or decreased. Thus, the volume of oil supplied with each rotation of the bushing is increased or decreased. Turning the pointer clockwise (CW) increases volume and decreases the time required to pass sufficient oil to initiate a shutdown; turning the pointer counterclockwise (CCW) has an opposite effect, that is, it increases the time-delay interval.

MODULATING GOVERNOR — WITH NO LOW OIL PRESSURE AND LOW WATER PRESSURE SHUTDOWN BUTTONS

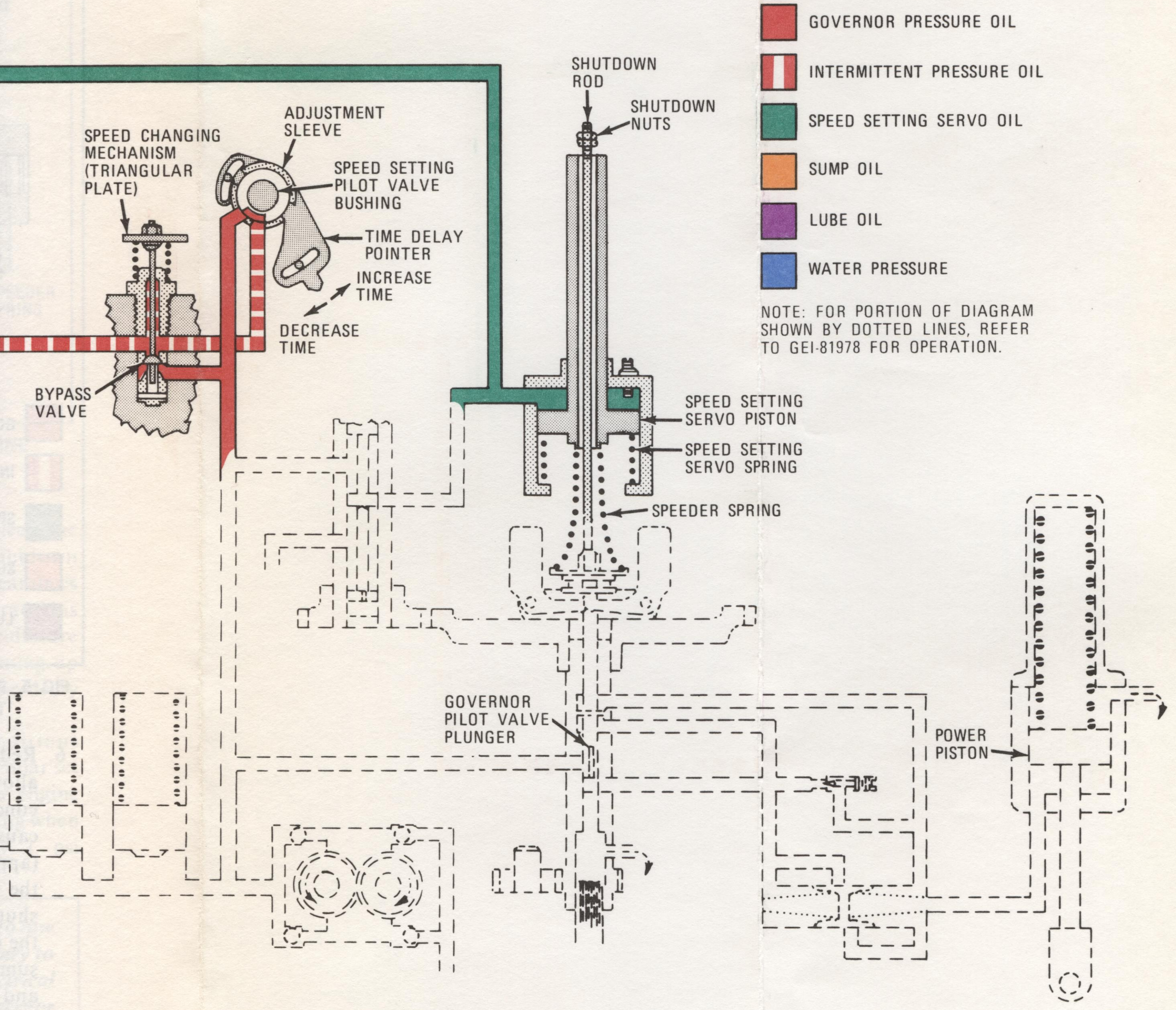
The low oil pressure failure device is shown in Fig. 4. This shows the parts of the device in the position they assume when the lube-oil pressure in the engine header is above the trip value.

When the lube-oil pressure in the engine header drops below the trip value, the following sequence of events occurs:

1. The force of the speed setting oil pressure and the shutdown valve plunger springs exceeds the force of the lube-oil pressure and the load spring. This causes the shutdown valve plunger to move to the left (Fig. 5).
2. Governor pressure oil passes around the shutdown valve plunger to the face of the shutdown piston.
3. The shutdown piston starts to move to the right. This movement also moves the shutdown plunger to the right.
4. The initial movement of the shutdown piston and shutdown plunger trips the switch. As the switch trips, the plunger will be moved further to the right to a point where the speed setting servo oil port begins to align with the pressure release slot and hole in the shutdown plunger.

NOTE: ***Shutdown plungers, prior to July, 1979, were as shown in Figs. 4, 5 and 6. They had a pressure-release slot and holes for conducting speed setting servo oil to the sump. After July, 1979, the plungers had a reduced-diameter section that performed this same function. The newer plunger is shown as an alternate design in Fig. 5.***

5. The tripped switch causes the locomotive electrical control system to reduce the electrical load on the diesel engine.


SPEED CHANGING MECHANISM (TRIANGULAR PLATE)
ADJUSTMENT SLEEVE
SPEED SETTING PILOT VALVE BUSHING
TIME DELAY POINTER
INCREASE TIME
DECREASE TIME
BYPASS VALVE
SHUTDOWN ROD
SHUTDOWN NUTS
🟥 GOVERNOR PRESSURE OIL
▨ INTERMITTENT PRESSURE OIL
🟩 SPEED SETTING SERVO OIL
🟧 SUMP OIL
🟪 LUBE OIL
🟦 WATER PRESSURE
SPEED SETTING SERVO PISTON
SPEED SETTING SERVO SPRING
SPEEDER SPRING
GOVERNOR PILOT VALVE PLUNGER
POWER PISTON

NOTE: FOR PORTION OF DIAGRAM SHOWN BY DOTTED LINES, REFER TO GEI-81978 FOR OPERATION.

FIG. 4. SCHEMATIC OF NEW PRESSURE FAILURE SYSTEM. ENGINE IS AT IDLE SPEED. OIL AND WATER PRESSURES ARE GREATER THAN TRIP SETTINGS.

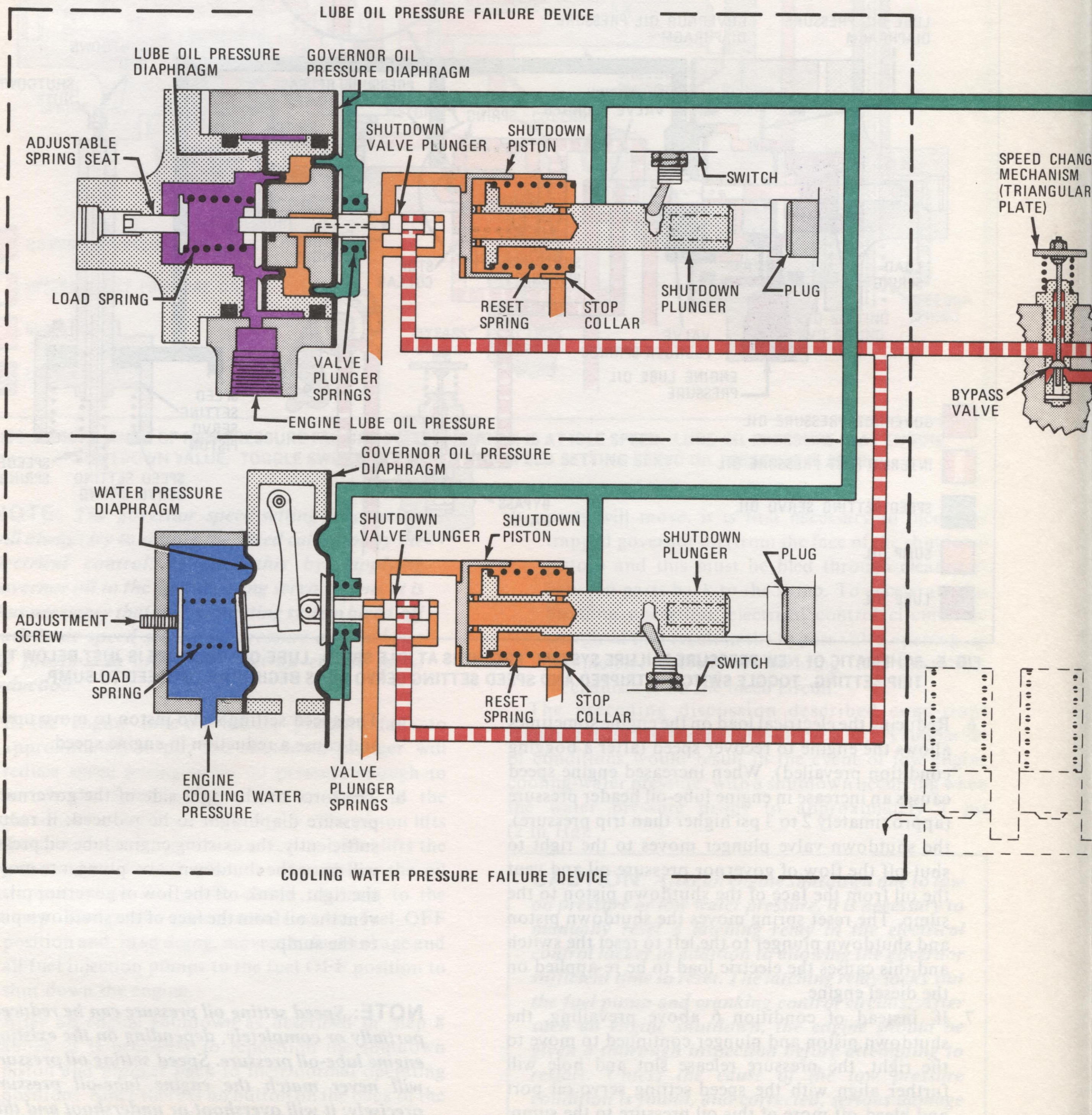

LUBE OIL PRESSURE FAILURE DEVICE
LUBE OIL PRESSURE DIAPHRAGM
GOVERNOR OIL PRESSURE DIAPHRAGM
ADJUSTABLE SPRING SEAT
SHUTDOWN VALVE PLUNGER
SHUTDOWN PISTON
SWITCH
SPEED CHANG MECHANISM (TRIANGULAR PLATE)
LOAD SPRING
RESET SPRING
STOP COLLAR
SHUTDOWN PLUNGER
PLUG
VALVE PLUNGER SPRINGS
ENGINE LUBE OIL PRESSURE
BYPASS VALVE
GOVERNOR OIL PRESSURE DIAPHRAGM
WATER PRESSURE DIAPHRAGM
SHUTDOWN VALVE PLUNGER
SHUTDOWN PISTON
SHUTDOWN PLUNGER
PLUG
ADJUSTMENT SCREW
SWITCH
LOAD SPRING
RESET SPRING
STOP COLLAR
ENGINE COOLING WATER PRESSURE
VALVE PLUNGER SPRINGS
COOLING WATER PRESSURE FAILURE DEVICE

FIG. 4, E-26606

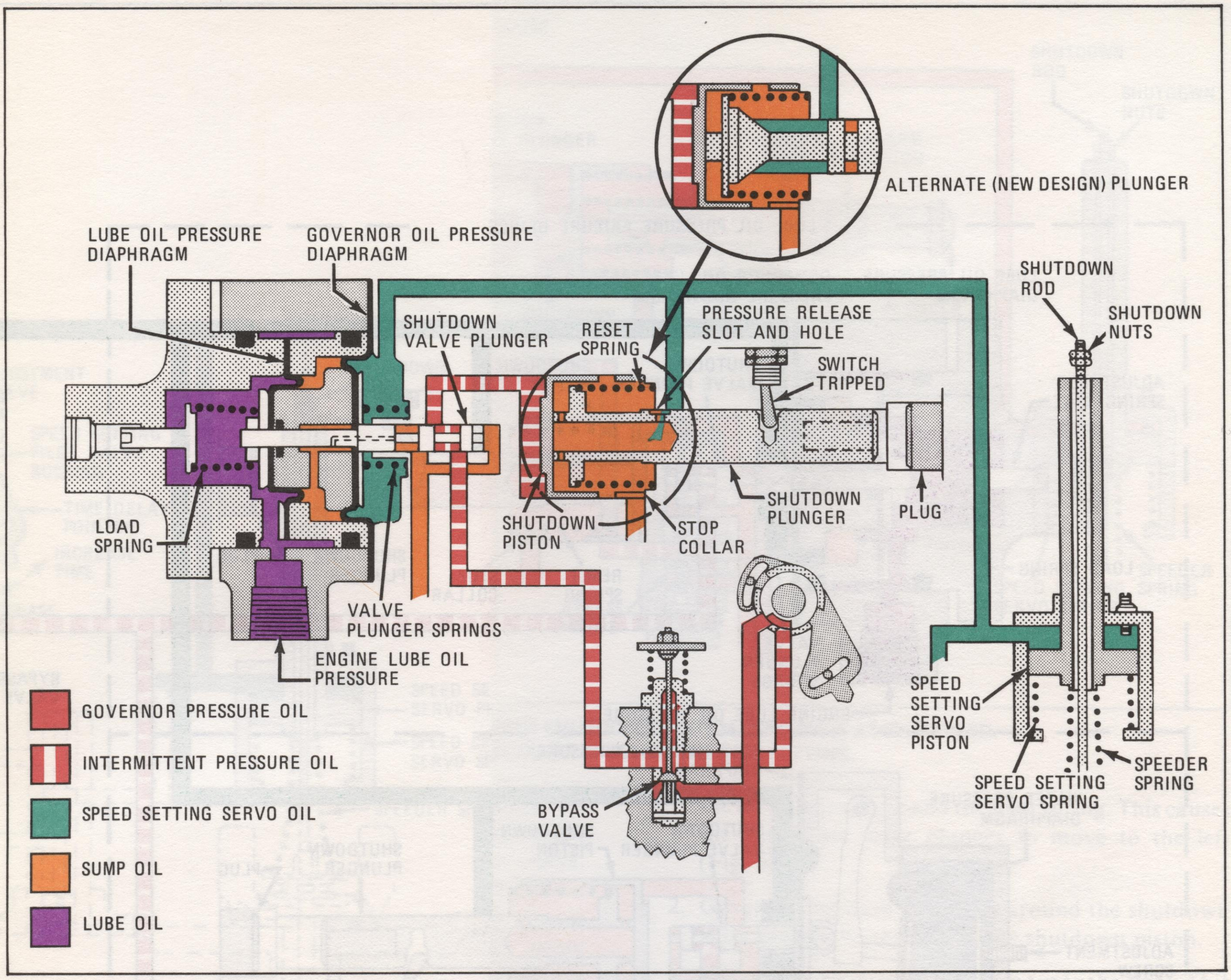

ALTERNATE (NEW DESIGN) PLUNGER
LUBE OIL PRESSURE DIAPHRAGM
GOVERNOR OIL PRESSURE DIAPHRAGM
SHUTDOWN VALVE PLUNGER
RESET SPRING
PRESSURE RELEASE SLOT AND HOLE
SWITCH TRIPPED
SHUTDOWN ROD
SHUTDOWN NUTS
LOAD SPRING
SHUTDOWN PISTON
STOP COLLAR
SHUTDOWN PLUNGER
PLUG
VALVE PLUNGER SPRINGS
ENGINE LUBE OIL PRESSURE
SPEED SETTING SERVO PISTON
SPEED SETTING SERVO SPRING
SPEEDER SPRING
BYPASS VALVE
🟥 GOVERNOR PRESSURE OIL
▥ INTERMITTENT PRESSURE OIL
🟩 SPEED SETTING SERVO OIL
🟧 SUMP OIL
🟪 LUBE OIL

FIG. 5, E-26607

FIG. 5. SCHEMATIC OF NEW PRESSURE FAILURE SYSTEM. ENGINE IS AT IDLE SPEED. LUBE-OIL PRESSURE IS JUST BELOW THE TRIP SETTING. TOGGLE SWITCH IS TRIPPED AND SPEED SETTING SERVO OIL IS BEGINNING TO BLEED TO SUMP.

6. Reducing the electrical load on the engine sometimes allows the engine to recover speed (after a bogging condition prevailed). When increased engine speed causes an increase in engine lube-oil header pressure (approximately 2 to 3 psi higher than trip pressure), the shutdown valve plunger moves to the right to shut-off the flow of governor pressure oil and vent the oil from the face of the shutdown piston to the sump. The reset spring moves the shutdown piston and shutdown plunger to the left to reset the switch and this causes the electric load to be re-applied on the diesel engine.
7. If, instead of condition 6 above prevailing, the shutdown piston and plunger continued to move to the right, the pressure release slot and hole will further align with the speed setting servo oil port and bleed-off more of this oil pressure to the sump. The resulting reduction in speed setting oil pressure will cause:
   a. The speed setting servo piston to move upward and cause a reduction in engine speed.
   b. The force on the right side of the governor oil pressure diaphragm to be reduced; if reduced sufficiently, the existing engine lube-oil pressure will cause the shutdown valve plunger to move to the right, blank-off the flow of governor oil, and vent the oil from the face of the shutdown piston to the sump.

NOTE: ***Speed setting oil pressure can be reduced partially or completely, depending on the existing engine lube-oil pressure. Speed setting oil pressure will never match the engine lube-oil pressure precisely; it will overshoot or undershoot and this may produce a "hunting" condition during the modulating cycle.***

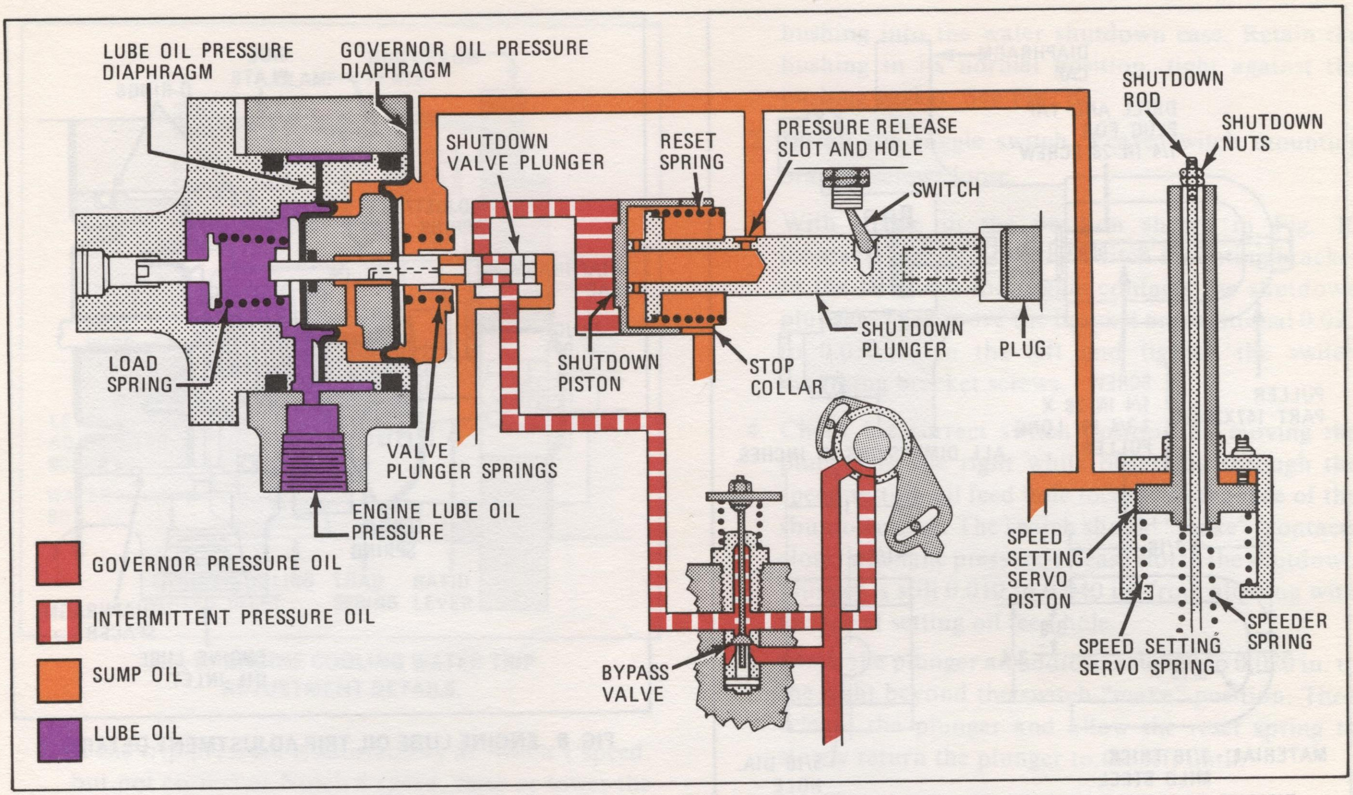

LUBE OIL PRESSURE DIAPHRAGM
GOVERNOR OIL PRESSURE DIAPHRAGM
SHUTDOWN VALVE PLUNGER
RESET SPRING
PRESSURE RELEASE SLOT AND HOLE
SHUTDOWN ROD
SHUTDOWN NUTS
SWITCH
SHUTDOWN PLUNGER
PLUG
STOP COLLAR
SHUTDOWN PISTON
LOAD SPRING
VALVE PLUNGER SPRINGS
ENGINE LUBE OIL PRESSURE
SPEED SETTING SERVO PISTON
SPEEDER SPRING
SPEED SETTING SERVO SPRING
BYPASS VALVE
GOVERNOR PRESSURE OIL
INTERMITTENT PRESSURE OIL
SUMP OIL
LUBE OIL

FIG. 6, E-26608

FIG. 6. SCHEMATIC OF NEW PRESSURE FAILURE SYSTEM. ENGINE IS AT IDLE SPEED. LUBE-OIL PRESSURE IS AT ENGINE SHUTDOWN VALUE. TOGGLE SWITCH IS TRIPPED AND SPEED SETTING SERVO OIL PRESSURE IS ZERO.

NOTE: ***The governor speed setting mechanism will always try to restore the speed called for by the electrical control. It does this by supplying governor oil to the speed setting servo system. It is thus necessary that the modulating system bleed off both basic speed setting oil pressure and makeup oil pressure in order to effect an engine speed reduction.***

8. If the engine lube-oil header pressure falls to approximately 4 psi, the shutdown plunger will reduce speed setting servo oil pressure enough to permit the speed setting piston to move to the maximum upward position, Fig. 6. The piston lifts the shutdown nuts and rod which, in turn, lifts the governor pilot valve plunger. This allows the oil trapped below the power piston to drain to the sump. The power piston moves to the fuel OFF position and, in so doing, moves the fuel linkage and all fuel injection pumps to the fuel OFF position to shut down the engine.

9. After an engine shutdown as described in Step 8 above, it is necessary to reposition the shutdown piston and plunger back to their normal operating positions. Since there is no button on the back of the governor to accomplish this operation, the parts must be moved to the left by the reset spring. Before parts will move, it is first necessary to bleed the trapped governor oil (from the face of the shutdown piston) and this must be bled through clearances between parts back to the sump. To accelerate this bleeding operation, electrical control circuits are energized that result in the bypass valve opening up completely, thereby eliminating the time-delay mechanism from the bleed circuit.

The preceding discussion described conditions resulting from low engine lube-oil pressure. A similar set of conditions would result in the event of low engine cooling-water pressure, with a shutdown occurring when the water pressure drops to approximately 1 psi (2 in Hg).

CAUTION: *After an engine shutdown due to low oil pressure or low water pressure, it is necessary to manually reset a latching relay in the electrical control locker in addition to allowing the governor sufficient time to reset. The latching relay locks out the fuel pump and cranking control circuits. After such an engine shutdown, the engine should be given a thorough inspection before attempting to restart. Unless the cause of the low pressure condition is found, and corrected, serious damage can result to engine components.*

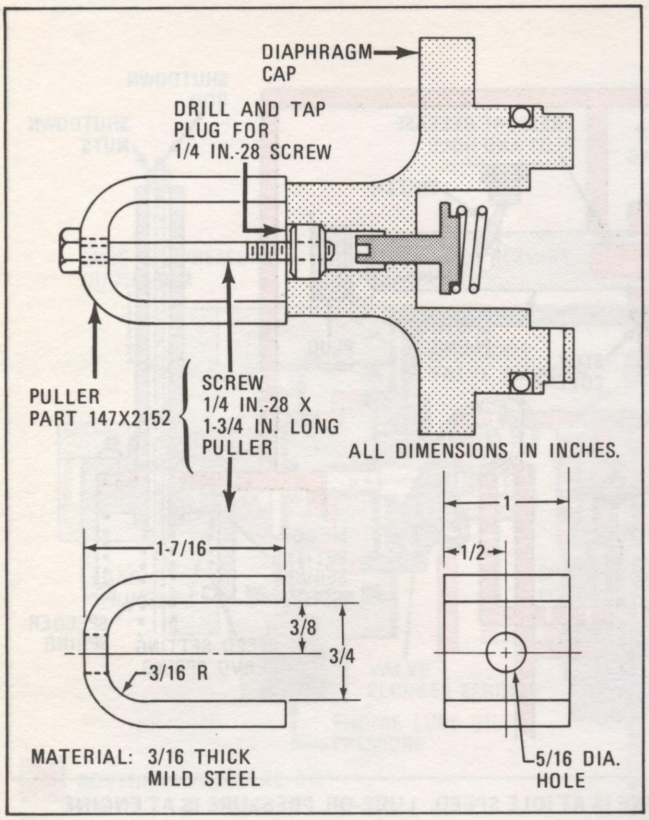

DIAPHRAGM CAP
DRILL AND TAP PLUG FOR 1/4 IN.-28 SCREW
PULLER PART 147X2152
SCREW 1/4 IN.-28 X 1-3/4 IN. LONG
PULLER
ALL DIMENSIONS IN INCHES.
1-7/16
3/8
3/4
3/16 R
1
1/2
5/16 DIA. HOLE
MATERIAL: 3/16 THICK MILD STEEL

FIG. 7. PULLER DETAILS.

FIG. 7, E-26609

ADJUSTMENTS

PLUG REMOVAL

Plugs are press-fitted in the front and rear of the low oil-pressure failure device and in the back of the low water-pressure failure device.

One method of removing a plug consists of:

1. Drill carefully thru the plug with a #3 (0.213 in. diameter) drill.
2. Tap hole with a 1/4 in. - 28 tap.
3. Apply puller, Part 147X2152, which can be purchased or made locally, Fig. 7.

LUBE OIL TRIP SETTINGS

1. Remove the plug from the diaphragm cap, Fig. 8.
2. With the governor mounted on a test stand and operating at Notch 8 speed, slowly bleed off the pressure applied to the face of the lube-oil pressure diaphragm. Governor should trip at the value specified in the GOVERNOR DATA instruction. If trip value is incorrect, raise the trip value by turning the adjustable spring seat CCW; lower the trip value by turning the seat CW. One turn of the screw will change the trip pressure about 0.75 psi.

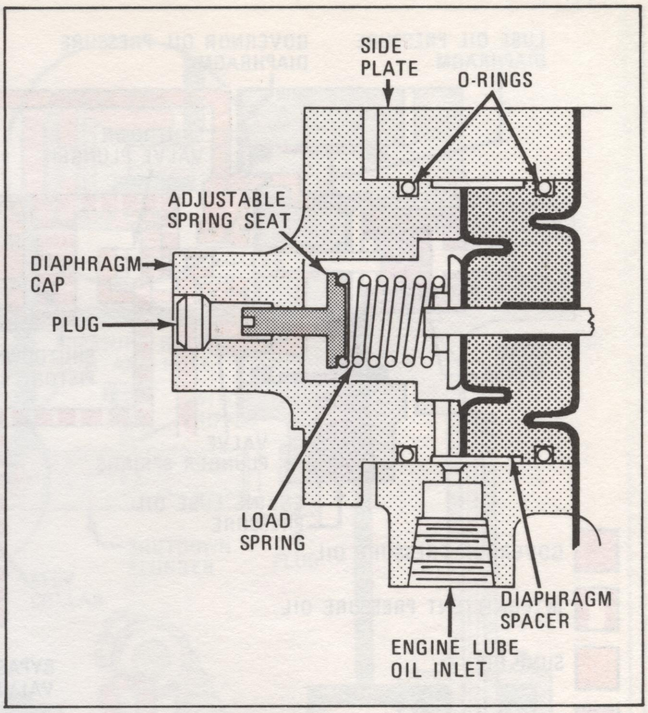

SIDE PLATE
O-RINGS
ADJUSTABLE SPRING SEAT
DIAPHRAGM CAP
PLUG
LOAD SPRING
DIAPHRAGM SPACER
ENGINE LUBE OIL INLET

FIG. 8. ENGINE LUBE OIL TRIP ADJUSTMENT DETAILS.

FIG. 8, E-26610

3. Operate the governor at Notch 1 speed, and slowly bleed off the pressure applied to the face of the lube-oil pressure diaphragm. Note that the governor should trip (after the time delay interval) between the range of values specified in the GOVERNOR DATA instruction.

NOTE: ***There is no specific adjustment for the oil trip pressure when at the Notch 1 speed setting. If the trip value for Notch 8 is correct and the trip value for Notch 1 is outside the range of trip values, apply a new speed setting servo spring.***

4. When lube-oil trip values are correct in Notch 8 and Notch 1, apply a new plug in the diaphragm cap.

COOLING WATER TRIP SETTINGS

1. With the governor mounted on a test stand, operate the governor at both Notch 8 and Notch 1 speeds. At each speed slowly bleed off the pressure applied to the face of the water pressure diaphragm. Governor should trip at the values specified in the GOVERNOR DATA instruction. If trip values are incorrect, break seal wire and loosen locknut, Fig. 9. To lower both trip pressures, turn the level adjustment screw CCW; to raise both trip pressures, turn the screw CW. One-half turn of the screw will change the trip pressure about 0.5 in. Hg.

FIG. 9, E-26611

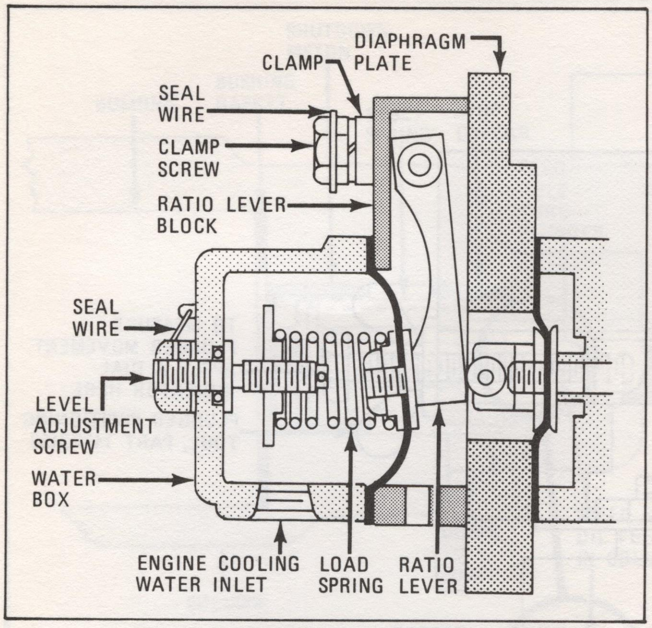


FIG. 9. ENGINE COOLING WATER TRIP ADJUSTMENT DETAILS.

2. If the trip pressure is satisfactory at Notch 1 speed, but not correct at Notch 8 speed, raise or lower the Notch 8 trip pressure by changing the differential adjustment. To do this, break seal wire and loosen clamp screws. To raise the trip pressure, raise the ratio lever block slightly; to lower the trip pressure, lower the block slightly. Secure the ratio lever block in its new position by tightening the clamp screws. Recheck the trip pressure in both Notch 8 and Notch 1 speed since a change in the differential adjustment will require a re-adjustment of the level adjustment described in Step 1 above.
3. Continue to make slight adjustments per Steps 1 and 2 above until correct trip pressure values are obtained.
4. Lock both the level and differential adjustments with seal wire.

POSITIONING COOLING WATER PRESSURE FAILURE SWITCH

NOTE: ***This operation can be performed at a bench or with the governor on a test stand. If performed during bench assembly, the correct position of the switch must be verified later with the governor on a test stand.***

The following procedure can be used at bench assembly with the plug removed from the shutdown case:

1. Assemble the stop collar, reset spring, shutdown plunger, shutdown piston, bushing gasket and bushing into the water shutdown case. Retain the bushing in its normal position, tight against the bushing gasket. See Fig. 10.
2. Install the toggle switch. Leave switch mounting bracket screws loose.
3. With toggle in the position shown in Fig. 10 (contacts open), move the switch mounting bracket to the left until the toggle contacts the shutdown plunger. Then move the bracket an additional 0.020 to 0.030 in. to the left and tighten the switch mounting bracket screws.
4. Check for correct switch position by moving the plunger to the right while observing through the speed setting oil feed hole located in the face of the shutdown case. The switch should "make" (contacts close) when the pressure-release slot in the shutdown plunger is still 0.010 to 0.040 in. from aligning with the speed setting oil feed hole.
5. Move the plunger an additional 0.050 to 0.070 in. to the right beyond the switch "make" position. Then release the plunger and allow the reset spring to slowly return the plunger to the left until:
    a. The switch contacts open.
    b. The plunger continues to move an additional 0.030 in. (minimum) before it comes to a stop (plunger in contact with the shutdown piston and the piston in contact with the bushing).
6. Assemble the balance of the water-pressure failure assembly and install it on the governor.
7. Recheck the position of the switch after the governor is mounted on a test stand. Follow the procedure given below for Positioning The Lube Oil Failure Switch.
8. Assemble a new plug in the back face of the shutdown case.

NOTE: ***Plunger movement can be manually controlled by using the plunger positioning tool, Part 147X2153. This may be purchased or can be made locally. The tool is made of:***

One (1) capscrew, hex. head, 1/4 in.-28 x 2 in. long
One (1) wing nut, 1/4 in.-28
One (1) flat washer

POSITIONING LUBE OIL PRESSURE FAILURE SWITCH

NOTE: ***This operation must be performed with the governor on a test stand.***

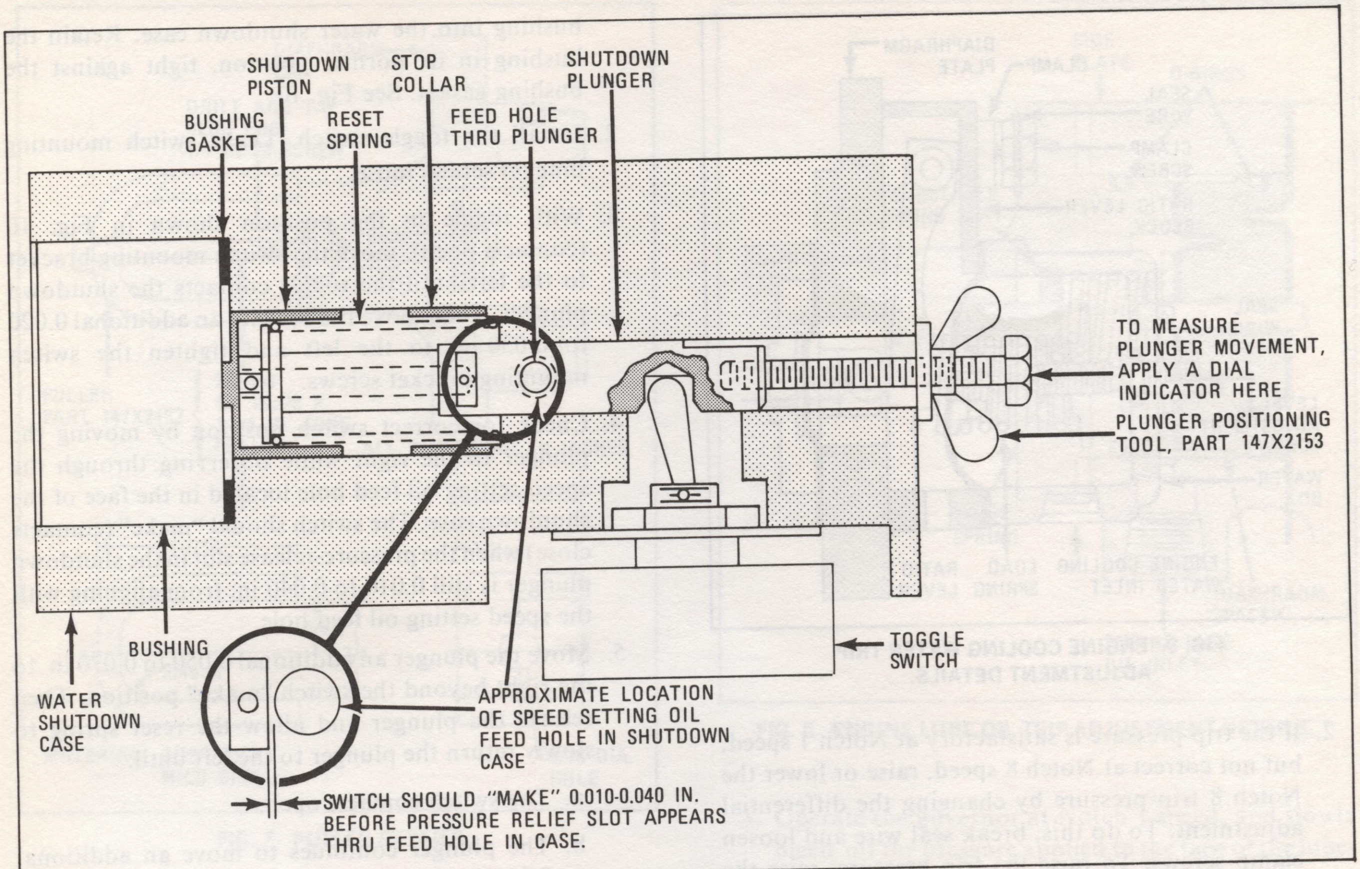

SHUTDOWN PISTON
STOP COLLAR
SHUTDOWN PLUNGER
BUSHING GASKET
RESET SPRING
FEED HOLE THRU PLUNGER
TO MEASURE PLUNGER MOVEMENT, APPLY A DIAL INDICATOR HERE
PLUNGER POSITIONING TOOL, PART 147X2153
TOGGLE SWITCH
BUSHING
WATER SHUTDOWN CASE
APPROXIMATE LOCATION OF SPEED SETTING OIL FEED HOLE IN SHUTDOWN CASE
SWITCH SHOULD "MAKE" 0.010-0.040 IN. BEFORE PRESSURE RELIEF SLOT APPEARS THRU FEED HOLE IN CASE.
FIG. 10, E-26612

FIG. 10. POSITIONING THE ENGINE WATER PRESSURE FAILURE TOGGLE SWITCH.

With the plug removed from the back face of the column:

1. Loosen the two screws which secure the switch mounting bracket to the receiver.
2. With the toggle switch in the untripped position, move the bracket to the left until the toggle contacts the shutdown plunger, Fig. 11. Move the switch and bracket an additional 0.010 to 0.030 in. to the left and tighten the two switch bracket screws.
3. Check the switch adjustment on a test stand with a dial indicator positioned on the end of the plunger or the end of the plunger positioning tool as follows:
   a. With the governor operating at Notch 8 speed, use the plunger positioning tool to move the plunger very slowly to the right.
   b. The switch should "make" (contacts close) when the pressure release slot in the shutdown plunger is still 0.010 to 0.040 in. from aligning with the speed setting oil feed hole.

   NOTE: ***The beginning of alignment between the plunger slot and the oil hole will be evident by a reduction in speed of 7 to 13 rpm.***

   c. Continue moving the plunger an additional 0.050 to 0.070 in. beyond the switch "make" position. Then release the plunger and allow the reset spring to slowly return the plunger to the left until:
      1) The switch contacts open.
      2) The plunger continues to move an additional 0.030 in. (minimum) before it comes to a stop (plunger in contact with the shutdown piston and the piston in contact with the bushing).
4. Assemble a new plug in the back face of the column.

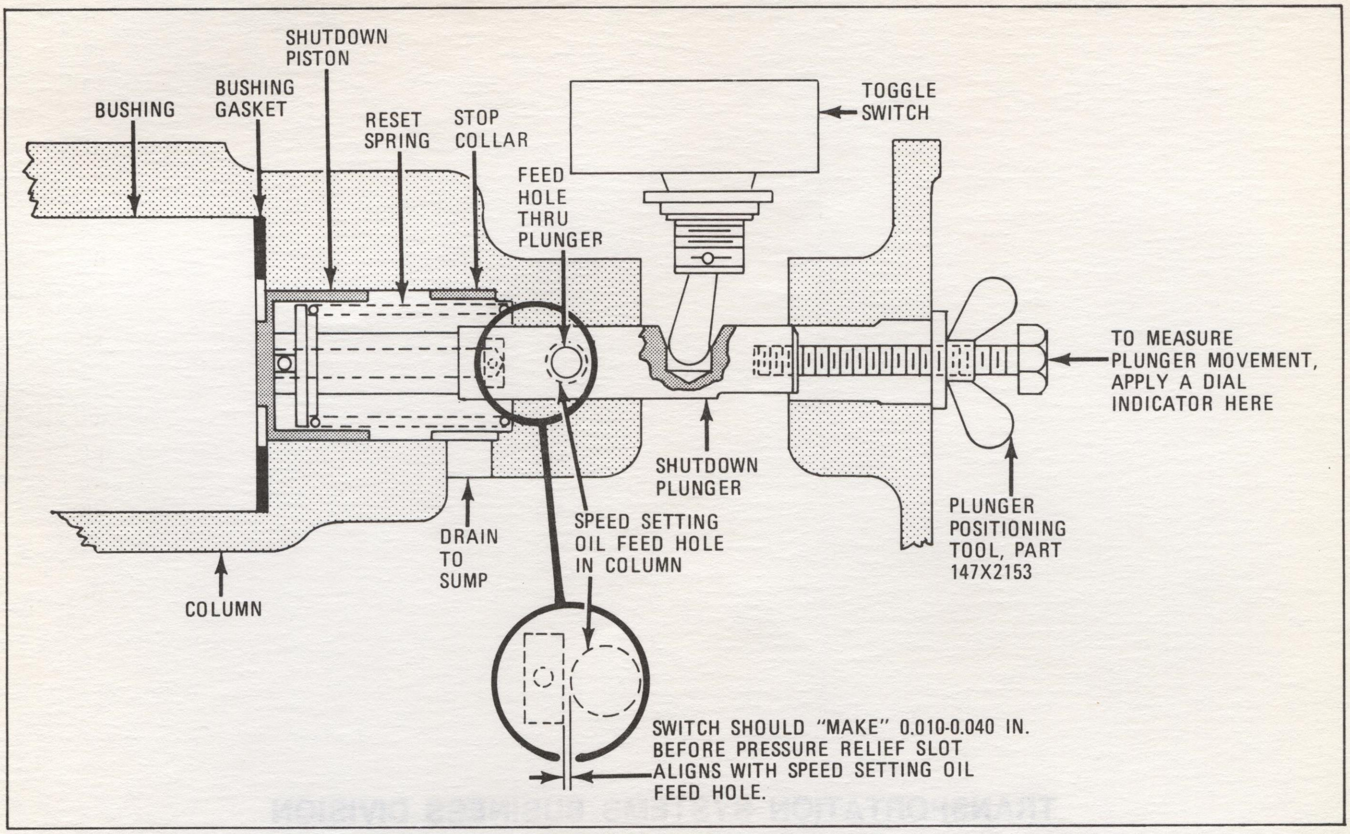

SHUTDOWN PISTON
BUSHING GASKET
BUSHING
RESET SPRING
STOP COLLAR
TOGGLE SWITCH
FEED HOLE THRU PLUNGER
TO MEASURE PLUNGER MOVEMENT, APPLY A DIAL INDICATOR HERE
SHUTDOWN PLUNGER
PLUNGER POSITIONING TOOL, PART 147X2153
DRAIN TO SUMP
SPEED SETTING OIL FEED HOLE IN COLUMN
COLUMN
SWITCH SHOULD "MAKE" 0.010-0.040 IN. BEFORE PRESSURE RELIEF SLOT ALIGNS WITH SPEED SETTING OIL FEED HOLE.

FIG. 11, E-26613

FIG. 11. POSITIONING THE ENGINE LUBE OIL PRESSURE FAILURE TOGGLE SWITCH.

NOTES: